

10. Organic Chemistry (SL)

10.1 Introduction

- ☐ Describe the features of a homologous series
- ☐ Predict and explain the trends in boiling points of members of a homologous series
- ☐ Distinguish between empirical, molecular and structural formula
- ☐ Describe structural isomers as compounds with the same molecular formula but with different arrangements of atoms
- ☐ Deduce structural formulas for the isomers of the non-cyclic alkanes up to C₆
- ☐ Apply IUPAC rules for naming the isomers of the straight-chain alkanes up to C₆
- ☐ Deduce structural formulas for the isomers of the straight chain alkenes up to C₆
- ☐ Apply IUPAC rules for naming the isomers of the straight-chain alkenes up to C₆
- ☐ *Deduce structural formulas for compounds containing up to six carbon atoms with one of the following functional groups: alcohol, aldehyde, ketone, carboxylic acid and halide
- ☐ Apply IUPAC rules for naming compounds containing up to six carbon atoms with one of the following functional groups: alcohol, aldehyde, ketone, carboxylic acid and halide
- ☐ Identify the following functional groups when present in structural formulas: amino (NH₂), benzene ring (C₆H₆) and esters (RCOOR)
- ☐ Identify primary, secondary and tertiary carbon atoms in alcohols and halogenoalkanes
- ☐ Discuss the volatility and solubility in water of compounds containing the functional groups listed in * above

10.2 Alkanes

- ☐ Explain the low reactivity of alkanes in terms of bond enthalpies and bond polarity
- ☐ Describe, using equations, the complete and incomplete combustion of alkanes
- ☐ Describe, using equations, the reactions of methane and ethane with chlorine and bromine
- ☐ Explain the reactions of methane and ethane with chlorine and bromine in terms of a free-radical mechanism

10.3 Alkenes

- ☐ Describe, using equations, the reactions of alkenes with hydrogen and halogens
- ☐ Describe, using equations, the reactions of symmetrical alkenes with hydrogen halides and water
- ☐ Distinguish between alkanes and alkenes using bromine water
- ☐ Outline the polymerization of alkenes
- ☐ Outline the economic importance of the reactions of alkenes

10.4 Alcohols

- ☐ Describe, using equations, the complete combustion of alcohols
- ☐ Describe, using equations, the oxidation reactions of alcohols
- ☐ Determine the products formed by the oxidation of primary and secondary alcohols

10.5 Halogenoalkanes

- ☐ Describe, using equations, the substitution reactions of halogenoalkanes with sodium hydroxide
- ☐ Explain the substitution reactions of halogenoalkanes with sodium hydroxide in terms of S_N1 and S_N2 mechanisms

10.6 Reaction pathways

- ☐ Deduce reaction pathways given the starting materials and the product

(HL only)

20.1 Introduction

- ☐ Deduce structural formulas for compounds containing up to six carbon atoms with one of the following functional groups: amine, amide, ester and nitrile
- ☐ Apply IUPAC rules for naming compounds containing up to six carbon atoms with one of the following functional groups: amine, amide, ester and nitrile

20.2 Nucleophilic substitution reactions

- ☐ Explain why the hydroxide ions is a better nucleophile than water
- ☐ Describe and explain how the rate of nucleophilic substitution in halogenoalkanes by the hydroxide ion depends on the identity of the halogen
- ☐ Describe and explain how the rate of nucleophilic substitution in halogenoalkanes by the hydroxide ion depends on whether the halogenoalkane is primary, secondary or tertiary
- ☐ Describe, using equations, the substitution reactions of halogenoalkanes with ammonia and potassium cyanide
- ☐ Explain the reactions of primary halogenoalkanes with ammonia and potassium cyanide in terms of the S_N2 mechanism
- ☐ Describe, using equations, the reduction of nitriles using hydrogen and a nickel catalyst

20.3 Elimination reactions

- ☐ Describe, using equations, the elimination of HBr from bromoalkanes
- ☐ Describe and explain the mechanism for the elimination of HBr from bromoalkanes

20.4 Condensation reactions

- ☐ Describe, using equations, the reactions of alcohols with carboxylic acids to form esters, and state the uses of esters
- ☐ Describe, using equations, the reactions of amines with carboxylic acids
- ☐ Deduce the structures of the polymers formed in the reactions of alcohols with carboxylic acids
- ☐ Deduce the structures of the polymers formed in the reactions of amines with carboxylic acids
- ☐ Outline the economic importance of condensation reactions

20.5 Reaction pathways

- ☐ Deduce reaction pathways given the starting materials and the product

20.6 Stereoisomerism

- ☐ Describe stereoisomerism as compounds with the same structural formula but with different arrangements of atoms in space
- ☐ Describe and explain geometrical isomerism in non-cyclic alkenes
- ☐ Describe and explain geometrical isomerism in C_3 and C_4 cycloalkanes
- ☐ Explain the difference in the physical and chemical properties of geometrical isomers
- ☐ Describe and explain optical isomerism in simple organic molecules
- ☐ Outline the use of a polarimeter in distinguishing between optical isomers
- ☐ Compare the physical and chemical properties of enantiomers